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EXAMINER	
PRENDERGAST, ROBERTA D	
ART UNIT	PAPER NUMBER
2628	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/727,679	MORETON ET AL.	
	Examiner	Art Unit	
	Roberta Prendergast	2628	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *14 March 2007*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,5,6,9,12-15 and 18-37* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *27-29* is/are allowed.

6)☒ Claim(s) *1,6,9,12,15,18-26,30,31 and 34* is/are rejected.

7)☒ Claim(s) *5,13,14,32,33 and 35-37* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *04 December 2003* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Drawings

The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they do not include the following reference sign(s) mentioned in the description: page 14, paragraph [0038] discloses that "...Fig. 4B edge 80 equals e<0,5>, and in Fig. 4C edge 80 equals e<1,0>..." however, edge 80 equals e<1, 0> in Fig. 4C and does not equal e<0,5> since it is not labeled in the drawings. Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the examiner does not accept the changes, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Objections

Claim 26 is objected to because of the following informalities: claim 26 concludes with the phrase "...in relation to a selected vertex of an originating primitive and one neighbor vertex of the selected...". Thus, claim 26 appears to be unfinished and examiner is unable to examine this claim since it is unclear how this claim should be written. Appropriate correction is required.

Claim Rejections - 35 USC § 101

Examiner acknowledges the amendment to independent claims 1, 15 and 27, filed 3/14/2007, overcoming the rejection of claims 1, 3-6, 9-15 and 18-29 under *35 USC § 101,* and therefore the rejection under *35 USC § 101* is hereby withdrawn.

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 15 and 18-26 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter, which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

Independent claim 15, lines 1-3, has been amended to include the limitation of "A computer-readable medium having stored thereon a software program determining a...".

Claims 18-26 depend from claim 15 and therefore include the limitation noted above.

Paragraphs [0065]-[0066] of the specification discloses a vertex RAM for storing vertex data. Paragraph [0084] discloses wherein the indexing techniques may be implemented either partially or entirely in a software program. However, the specification does not teach a computer-readable medium having stored thereon a software program as claimed in claims 15 and 18-26.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1, 12 and 30 are rejected under 35 U.S.C. 102(b) as being anticipated by Huang et al. U.S. Patent No. 6825839.

Referring to amended claim 1, Huang et al. teaches a method for execution by a processor for indexing and storing vertex data associated with the vertices that define neighboring primitives to enhance primitive processing by the processor, comprising selecting a reference vertex (Fig. 4; column 4, lines 34-40; column 5, lines 3-12, i.e. a reference vertex is selected in order to generate a vertex neighboring graph VNB for that particular vertex); identifying one-ring neighbor vertices of the reference vertex; assigning a unique reference to each of the one-ring neighbor vertices; assigning a unique neighbor index to each of the one-ring neighbor vertices in a sequential order

around the reference vertex (Fig. 4; column 4, lines 34-40; column 5, lines 3-12, i.e. each neighbor of the reference vertex is identified by a unique reference number, for example figure 4 indicates the reference vertex v0 has a unique reference 1 and its one-ring neighbor vertices v1, v3 and v5 have the reference numbers 3, 4 and 2 respectively, and inserted into VNB of the reference vertex in their unique neighbor index positions of 0, 1 and 2 in a sequential order, such as decreasing reference numbers, around the vertex); and storing the neighboring primitives associated with the one-ring neighbors based on the assigned neighbor indexes (Fig. 4; column 5, lines 3-12, i.e. neighboring primitives are stored in two-dimensional arrays, for example, incident edge table INC stores the list of triangles incident to the edge, such as edge 1,2 stores triangle 0 and VNB stores the one-ring neighbors of the reference vertex, such as VNB(1) stores one-ring neighbors 2, 3 and 4 for reference vertex 1 while triangle list TL stores the triangles used in the model wherein each triangle is represented as an ordered list of the references (indices) to the vertex table, which contains an ordered list of all the vertices used in the model), wherein unique neighbor index includes an offset which is unique to each of the neighboring primitives (Figs. 3, 4 and 10; column 2, lines 44-63; column 4, lines 35-49 and 61-66; column 5, lines 3-12, i.e. each vertex of a triangle mesh is given a unique reference/index in the vertex table VT and a unique index position in a vertex neighborhood graph VNB represented as a two dimensional array and each one-ring neighbor of each vertex is given a unique neighbor index position in an array located at that unique index position for example, for reference vertex 1, represented as VNB(1), neighbor 1 has a unique reference number 2 and has

a unique neighbor index of 0, neighbor 2 has a unique reference number 3 and has a unique neighbor index of 1, and neighbor 3 has a unique reference number 4 and has a unique neighbor index of 2 in the two dimensional array) and wherein the offset is used to specify a consistent order of calculation for use during primitive processing (Fig. 4; i.e. each one-ring neighbor is processed in ascending order from the first position in the array until the last position).

Referring to claim 12, Huang et al. teaches the method of claim 1, further comprising identifying an edge between a first vertex and a second vertex, the second vertex being a one-ring neighbor of the first vertex (Fig. 4; column 5, lines 13-35, i.e. each vertex of each edge in the Incident Edge Table is a one-ring neighbor of the other, for example, for edge (v_0, v_1) vertex v_0 is a one-ring neighbor of vertex v_1 and vertex v_1 is a one-ring neighbor of vertex v_0 since there are no other vertices located between them).

Referring to claim 30, Huang et al. teaches the method as in claim 1 wherein one or more vertex of the primitive is stored in only one location and is accessible in more than one way based on one of the unique neighbor indexes (column 4, lines 43-53; column 5, lines 3-20, i.e. each vertex can be accessed via the vertex table, containing the vertices used in the model and representing the original model, a tessellated triangle list, representing each triangle as an ordered list of indices into the vertex table, or via the vertex neighborhood graph that stores the connection information between the vertices thus indicating multiple ways of accessing one or more vertices of a primitive that is stored in only one location, which is understood to be the vertex table).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 6, 9, 31 and 34 is rejected under 35 U.S.C. 103(a) as being unpatentable over Huang et al. U.S. Patent No. 6825839 as applied to claims 1 and 30 above, and further in view of Li et al. U.S. Patent No. 6262737.

Referring to claim 9, Huang et al. teaches the method of claim 1 wherein the indexing is related to three-dimensional computer graphics (column 1, lines 20-35) but does not specifically teach wherein the at least one primitive defines a volume.

Li et al. teaches wherein the at least one primitive defines a volume (Figs. 7(a and b) and 9; column 5, lines 45-50; column 13, lines 15-22; column 14, lines 48-60, i.e. a tetrahedron is the simplest primitive that defines a volume while a cube is the next simplest, rectangles are used in the smooth part of a surface while triangles are used to more accurately model areas that are not smooth).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the method of Huang et al. to include the teachings of Li et al. wherein the at least one primitive defines a volume thereby providing the simplest 3-D mesh, since most meshes consist primarily of triangles and quadrangles thus the simplest 3-D mesh would be a tetrahedral or cube mesh, that can

be coded as a regular mesh with only a few bits wherein the vertices are indexed prior to processing (column 5, lines 45-50; column 13, lines 19-22; column 14, lines 48-60).

Referring to claim 31, the rationale for claim 30 is incorporated herein, Huang et al. teaches the method of claim 30 but does not specifically teach storing a valence for the reference vertex defining the number of one-ring neighbor vertices for the reference vertex.

Li et al. teaches totaling the one-ring neighbor vertices sharing an edge with the vertex to provide a total and indicating the total as a valence of the vertex (Figs. 8(a and b), i.e. in 8a the two vertices have a valence of 5 and collapsing the edge connecting these two vertices gives a new vertex with a valence of 6; column 13, lines 18-19, i.e. a valence n gives the total number of neighboring vertices).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the method of Huang et al. to include the teachings of Li et al. thus storing a valence for the reference vertex thereby providing connectivity information such as the number of neighboring vertices and the number of edges connecting the reference vertex to its neighbors for a simple base mesh that can be coded as a regular mesh with only a few bits (column 13, lines 19-22).

Referring to claim 6, the rationale for claim 31 is incorporated herein, Huang et al., as modified above, teaches the method of claim 31, wherein the polygonal primitive is a triangular primitive (Fig. 4 and 6; column 3, lines 60-65).

Referring to claim 34, the rationale for claim 31 is incorporated herein, Huang et al., as modified above, teaches the method of claim 6 wherein edge data defining each

edge of the triangular primitive is referenced in one of two ways (Fig. 4; column 5, lines 3-26, i.e. using an adjacency list to implement the vertex neighborhood graph is understood to store edge data providing pointers from a selected reference vertex to each neighbor vertex and the incident edge table gives a list of triangles that are incident to each valid edge element listed in the table indicating that each edge of a triangle is referenced in the incident edge table INC).

Allowable Subject Matter

Claims 27-29 are allowed.

The following is an examiner's statement of reasons for allowance:

Referring to claims 27-29, cited prior art does not teach a method for execution by a data processor for indexing vertex data defining at least one primitive to enhance primitive processing by the processor, comprising: assigning a unique reference to each vertex defining the at least one primitive; identifying one-ring neighbor vertices of each vertex; assigning the unique reference to each of the one-ring neighbor vertices of each vertex; assigning a unique neighbor index to each of the one of the one-ring neighbor vertices of each vertex wherein a unique neighbor index includes a user-specified offset to specify an order of calculation in primitive processing; and storing the primitives for display as claimed.

Claims 5, 13, 14, 32, 33 and 35-37 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Referring to claim 32 cited prior art does not teach a method as in claim 31 wherein direction of ordering of neighbor indexes is user specified.

Referring to claims 5, 33 and 35 cited prior art does not teach a method as in claim 31 wherein the valence is the number of vertices that share an edge with the reference vertex and is stored with a modulo of the reference vertex to determine the neighbor index, where modulo is a total number of one-ring neighbors of one of the neighbor vertices.

Referring to claims 13 and 14, cited prior art teaches the method of claim 12 but does not teach assigning the unique reference of the first vertex to the edge and assigning the unique neighbor index of the second vertex to the edge and further does not teach assigning the unique reference of the second vertex to the edge; and assigning the unique neighbor index of the first vertex to the edge.

Referring to claim 36, cited prior art teaches the method as claimed in claim 1 but does not teach storing edge data for each neighbor primitive to a reference primitive, wherein only edges adjacent to or shared by a user selected reference vertex of the reference primitive are defined as one of the neighbor primitives.

Referring to claim 37, cited prior art does not teach wherein the offset is used to reference control points related to the stored vertex data, wherein the control point includes at least one attribute chosen from the groups consisting of position coordinates and texture coordinates.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably

accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Response to Arguments

Applicant's arguments filed 3/14/2007 have been fully considered but they are not persuasive.

Applicant argues, with respect to the objection to the drawings, "...Paragraph [0038], which describes these figures, states at line two that edge data may be referenced in one of two ways by using the novel approach of the present invention. Thus, the application gives an example, "Fig. 4B edge 80 equals e<0,5>, and in Fig. 4C edge 80 equals e<0,1> ". A comparison of Figs. 4B and 4C indicates that both this sentence and the figures are correct. The edge 80 in Fig. 4B is referenced to the lower vertex 42B, but the same edge data in 4C is referenced to the upper vertex 41C. Thus, the example cited by the Examiner, indicates the power and versatility of the present invention rather than being an erroneous example ...".

Examiner respectfully submits that, while both Figures 4B and 4C have an edge 80, there is no indication in Figure 4B that edge 80 equals e<0,5> since the edge is not labeled with element e<0,5>. In Figure 4C edge 80 is labeled with element e<0,1> indicating that edge 80 equals e<0,1> as indicated in paragraph [0038] of the specification.

Applicant then argues, with regard to claim 26, "...Claim 26 is objected to as being informal for being incomplete. Therefore, the cited claim has been edited to complete the statement ...".

Examiner respectfully submits that, in the amendment to the claims filed 3/14/2007, claim 26 has not been edited to complete the statement and therefore the objection to claim 26 will not be withdrawn, as it is incomplete.

Examiner further submits that the rejection of claims 1,3-6, 9-15 and 18-29 as being non-statutory for failing to claim a practical application of the method that produces a real world result under 35 USC 101 has been withdrawn.

Examiner also submits that the rejection of claims 1,3-6 and 9-14 under 35 USC 112 as failing to comply with the written description requirement have been withdrawn due to the amendment claims 1, 3-6 and 9-14 filed 3/14/2007. However, the amendment to claims 15 and 18-26 introduces new matter, i.e. "A computer-readable medium having stored thereon a software program determining a...". Paragraphs [0065]-[0066] of the specification discloses a vertex RAM for storing vertex data. Paragraph [0084] discloses wherein the indexing techniques may be implemented either partially or entirely in a software program. The specification does not teach a computer-readable medium having stored thereon a software program as claimed and therefore claims 15 and 18-26 are now rejected under 35 USC 112.

Applicant then argues, with respect to the 35 USC 102(b) rejection of claims 1, 3-6, 9-15 and 18-29, "...The method includes a step of selecting a reference vertex, identifying neighbor vertices, assigning references and a sequential order to the

neighboring vertices, and storing the primitives by storing the primitive vertices using the unique indexes selected. The unique neighbor index preferably includes an offset relative to the neighboring primitives which enables a consistent order of calculation during primitive processing of neighboring primitives and enables the processing of primitives to begin either at the reference vertex or primitive or anywhere around the ring of surrounding vertexes and primitives. This scheme and method is enabled by the fact that the offset is user-specified and is used to specify the order of calculation over one or more rings of neighbors of vertices and primitives to the reference vertex and primitives ..." and "...Huang does not store neighboring primitives by their vertices, define one-neighbor vertices, or assign offsets to these vertices to enable calculation of each of the primitives. Rather, Huang stores a sequence of vertices that is independent of the order of neighbors (see Fig. 6A). Each pair of vertices is used to contract an edge of a primitive so that by following steps B, E of Fig. 6, each of the edges is contracted to form a fully collapsed skeleton. This is in contrast to the features disclosed and claimed in the pending independent claims and emphasized in the dependent claims (see Claim 30). The vertices of the primitives are stored in one location. Such a feature, as claimed in the independent claims or found in the dependent claims, cannot be achieved in Huang. Huang does not teach storing the neighboring primitives by their vertices. Rather than processing and storing the vertices, Huang teaches only processing and collapsing of edges. The independent, separate vertex data is lost, not stored. The vertex data, which is expressly available and utilized in the method claimed in the present invention, cannot be taught or made obvious by the teachings of Huang. The

data which must be provided to carry out the claimed order of calculation is lost in the collapse of the vertex model carried out by Huang. The Li citation does not overcome these deficiencies...".

Examiner respectfully submits that claims 27-29 have been amended to include the limitation "wherein a unique neighbor index includes a user-specified offset to specify an order of calculation in primitive processing" and has been indicated as allowable.

Examiner further submits that claims 5, 13, 14, 32, 33 and 35-37 are objected to as being dependent upon a rejected base claim, see above.

Examiner further submits, with regards to claims 1, 3, 4, 6, 9-12, 15 and 18-26, that Huang et al. teaches preprocessing steps for indexing and storing vertex data associated with the vertices that define neighboring primitives as claimed, see rationale for claim 1 above, and how or what portion of the primitives are being processed after the indexing and storing step is not being claimed. Specifically, Huang et al. teaches indexing and storing the vertex data in a Vertex Table VT, a triangle list TL, a Vertex Neighborhood Graph VNB and an incident edge table INC in a preprocessing step, see columns 4-5, lines 34-26, a user specified offset and subsequent processing steps to be performed on the indexed data are not claimed. Applicant is arguing against the results of the cited prior art's processing steps however applicant does not claim specific processing steps being implemented in the vertices and primitives once they have been indexed according to the method claimed and thus it would be obvious to one having ordinary skill in the art at the time the invention was made that performing an edge

collapse/vertex elimination process on the indexed and stored vertex data does not indicate that the data was not indexed and stored in the preprocessing step as examiner indicated in the claim rejections above.

Examiner respectfully submits that the amendment to claim 1 has been addressed in the rejection of claim 1 above.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Roberta Prendergast whose telephone number is (571) 272-7647. The examiner can normally be reached on M-F 7:00-4:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ulka Chauhan can be reached on (571) 272-7782. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

RP 5/29/2007

Ulka Chauhan
Supervisory Patent Examiner